

REMARKS

Claims 1 to 6 are under consideration in the application. Claims 7 to 9 have been withdrawn from consideration due to a restriction requirement.

§103

Claims 1 to 6 were rejected under 35 U.S.C. §103(a) as being unpatentable over the computer generated English translation of Japan No. 2002-80934 (the “ ‘934 patent”).

This rejection is respectfully traversed.

The Present Invention

The present invention provides a steel sheet for vitreous enameling excellent in workability, aging properties and enameling properties, wherein the steel contains, C: 0.0050% or less, Si: 0.50% or less, Mn: 0.005 - 1.0%, P: $10 \times (B - 11/14 \times N) - 0.10\%$, S: 0.080 or less, Al: 0.050% or less, N: 0.0005 - 0.020%, B: $0.60 \times N - 0.020\%$, O: 0.002 - 0.080%, and the balance being Fe and unavoidable impurities, and the steel sheet further containing simple or compound nitrides having a diameter of 0.02 to 0.50 μm which contain B or Al, and having an average diameter of 0.080 μm or larger, and the proportion of the number of the nitrides of 0.050 μm or smaller in diameter to the total number of nitrides being 10% or less.

The technology disclosed in the ‘934 patent relates a steel sheet for enameling having nonaging properties and excellent in foam and black point resistance without depending on decarburization-denitrifying annealing increasing without containing Nb and Ti, wherein the steel sheet contains; C: 0.0018% or less, Si: 0.020% or less, Mn: 0.10 - 0.30%; P: 0.010 - 0.035%, S: 0.035% or less, Al: 0.010% or less, N: 0.0008 - 0.0050%, B: 0.0050% or less and more than $0.6 \times N$, O: 0.005 - 0.050%, and having a diameter of BN of 0.005 - 0.50 μm or an average diameter of composite precipitates containing BN of 0.005 - 0.50 μm of 0.010 μm or more and the ratio of BN or composite precipitates containing BN having a diameter of less than 0.010 μm of 10% or less, and where the steel sheet is produced by a process comprising the steps of heating a slab at 1000 -

1150°C, hot rolling, coiling at 650 - 750°C, cold rolling with the reduction rate of more than 60%, recrystallization annealing and skin-pass rolling with a reduction rate of less than 5%.

The Office Action takes the position that "such overlap in nitride ranges establishes a prima facie case of obviousness because it would be obvious for one skilled in the art to select the claimed ranges over the broader disclosure of the prior art since the prior art teaches the same utility and properties", and further asserts "even though the prior art product is made by different process, such would not be a patentable distinction". It is respectfully submitted that this understanding of the Office Action is not correct.

The present invention targets to improve workability using coarser nitrides than those of the '934 patent as shown in Fig. 1 attached hereto, because the present invention uses coarse particles (nitrides) having an average diameter of 0.080 μm or larger as a hydrogen trap site. To the contrary, the '934 patent uses fine dispersed precipitates having a diameter of 0.010 μm or larger as a hydrogen trap site, which cannot trap enough hydrogen.

As mentioned above, the distribution of precipitates (nitrides) in the '934 patent is as follows:

- 1) a diameter of BN or composite precipitates containing BN of 0.005 - 0.50 μm , and the ratio of number with a diameter less than 0.010 μm of 10% or less,
- 2) an average diameter of more than 0.010 μm for BN or composite precipitates containing BN having a diameter of 0.005 - 0.50 μm .

On the other hand, the precipitates according to the present invention are B nitride or Al nitride, and distribution of precipitates (nitrides) is as follows.

- 1) a diameter of 0.02 - 0.50 μm which contains B or Al, and having the average diameter of 0.080 μm or larger,

2) the proportion of the number of the nitrides of 0.050 μm or smaller in diameter to the total number of said nitrides being 10% or less.

As mentioned above, most of the precipitates in the '934 patent have a diameter of more than 0.010 μm , because, as shown in RS% in Table 2, the proportion of fine precipitates of less than 0.010 μm of diameter is less than 10%, and at most 35%. Further, the average diameter of precipitates is shown in RA in Table 2 and most of all the precipitates have a diameter of less than 0.03 μm . In addition, it is clearly understood that most of the precipitates of the '934 patent have a diameter of less than 0.050 μm .

This means that the '934 patent never satisfies the condition of "0.050 μm or smaller in a diameter to the total number of said nitrides being 10% or less" as defined in the present invention. Therefore, the present invention is different from the technology disclosed in the '934 patent.

As shown in the Example of the present invention, Table 3 shows the average diameter of precipitates is about 0.09 - 0.55 μm . On the other hand, the average diameter of precipitates RA shown in Table 2 in the Example of the '934 patent is 0.009 - 0.032 μm . This is shown in the Fig. 1 attached hereto.

This difference is caused by a combination of the steel compositions with the production process. The coarse precipitates are formed by the specific steel compositions, such as C, Si, Mn, Al, B, N for forming oxides, and Al and B for forming nitrides, and the addition of P. Especially, P must be added in balance with the amounts of B and N for controlling the formation of nitrides. This is accomplished by the production process of the present invention, especially the hot rolling conditions, such as, the slab is retained at a temperature of 900 - 1000°C for more than 300 minutes, and retaining it in a temperature range not less than 50°C or higher than the above temperature for 10 - 30 minutes, then cooling it to a temperature range not less than 50°C or lower

than that of the retained temperature at a cooling rate of 2°C/sec or less, then further retaining it in the above retained temperature for 10 minutes or longer and thereafter commencing hot rolling. (See method claim 7 of the present application). Further, the hot rolling is controlled under the condition of the time period from the time when the coiling of hot rolled steel sheet terminates at a temperature of 700 - 750°C in a hot rolling process to the time when the temperature of the steel sheet reaches 550°C or lower for 20 minutes or longer. (See method claim 8 of the present application).

Control of the temperature history during hot rolling and after hot rolling as it relates to precipitates is discussed in the specification of the present application starting at page 10, line 29.

Regarding workability, the present invention increases workability utilizing a coarse nitrides for trapping hydrogen. On the other hand, the '934 patent does not so much increase workability because of finely dispersed precipitates. As shown in attached Fig. 2, the present invention increases both of total elongation and tensile strength.

It is therefore submitted that the present invention is not disclosed or suggested by the '934 patent.


It is therefore submitted that claims 1 to 6 are patentable over the '934 patent.

CONCLUSION

It is submitted that in view of the foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application be allowed and passed for issue.

Respectfully submitted,

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